

At home on a crab, with new evolutionary neighbors

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Courting of *Drosophila endobranchia* flies on their host crab. Credit: Max Planck Institute for Chemical Ecology/Stensmyr

The members of *Drosophilidae*, a family consisting of about 3000 species, are often referred to as fruit flies although most of the members feed on microbes. As microbes can be found growing on a wide range of substrates, fruit flies can accordingly also be found in a multitude of habitats.

One of the more bizarre choices of breeding substrates comes from *Drosophila endobranchia*. This species is one out of three known fruit flies that have found a home on (and inside) land-crabs. Although frequently mentioned in biology textbooks, the crab flies have somewhat surprisingly been neglected in active research since their description. *D. endobranchia* has actually not even been seen since its initial discovery in 1966.

In January 2007, scientists from Bill Hansson's group at the Max Planck Institute for Chemical Ecology, Germany, managed to relocate these elusive flies on Grand Cayman in the Caribbean (the sole known home of this species), where small fragmented populations still persist in the few remaining patches of suitable habitats. Concomitant with the insects' re-exploration, a long-standing question regarding *D. endobronchia*'s evolutionary position within the Drosophilidae, disputed since its discovery due to a conflicting set of morphological characteristics, was resolved, based on a new comprehensive molecular and morphological analysis.

Surprisingly, the Cayman crab flies are quite closely related to the other Caribbean crab fly, *Drosophila carcinophila*, suggesting that something in their shared ancestry has made these flies more suitable for this most unconventional lifestyle.

A well known species of the Drosophilidae family is the fruit fly, *Drosophila melanogaster*, model organism for genetic studies since decades. There are also three members of the family, *D. endobronchia*, *D. carcinophila*, and *Lissocephala powelli*, which are known to fulfill all or parts of their life cycle on land crabs, and each of them in different areas of the globe. While *Lissocephala powelli* seems to be restricted to the Christmas Island in the Indian Ocean, the other two species appear at different locations of the Caribbean. *D. endobronchia*, the least described of the three, was last seen on the Cayman Islands in 1966. The phylogenetic position of this species, i.e. the place it occupies in the tree of life, has remained disputed.

Therefore, Marcus Stensmyr and colleagues decided to relocate this species in the Cayman Islands in order to re-define the phylogeny of this organism with current molecular techniques and shed light on the evolutionary history of this interesting trait.

A search for the Cayman crab flies in 2007 was successful, leading to the collection of 66 specimens. The phylogeny of this species was determined with the aid of molecular biology, which allowed the Max Planck researchers to place *D. endobanchia* within the *canalinea* species group, a little known Neotropical group of forest dwelling flies that belongs to the large repleta radiation that also includes *D. carcinophila*, the second Caribbean crab fly.

“It is intriguing that two species in the same lineage evolved the same odd choice of breeding substrate,” says Marcus Stensmyr, “it makes us wonder which aspects of their shared ancestry allow them to survive and thrive in this most specialized environment”.

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